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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/066,115	02/01/2002	Peter Jivan Shah	020103	6021

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QUALCOMM INCORPORATED
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EXAMINER	
BHATTACHARYA, SAM	
ART UNIT	**PAPER NUMBER**
2617	

NOTIFICATION DATE	DELIVERY MODE
08/14/2007	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

us-docketing@qualcomm.com
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Office Action Summary	Application No.	Applicant(s)	
	10/066,115	SHAH, PETER JIVAN	
	Examiner	Art Unit	
	Sam Bhattacharya	2617	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *16 May 2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *47-98* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *47-98* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 5/16/07 has been entered.

Claim Rejections - 35 USC § 103

2. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

3. Claims 47-72, 75, 78 and 81-93, 95-98 are rejected under 35 U.S.C. 103(a) as being unpatentable over Faulkner (U.S. Patent 6,606,484) in view of Kenington (US 6,437,644) and Chapman et al. (US 5,051,704).

Regarding claims 47 and 98, Faulkner discloses a circuit including a compensation branch 5 for reducing second order non-linear distortion in a receiver 3, 8 caused by jammers during direct down conversion of a received RF signal by the receiver, the compensation branch being adapted to be coupled to the receiver to reproduce the second order nonlinear distortion (intermodulation interference) in the receiver (see col. 3, lines 52-67 and col. 5, lines 5-10) and including a squaring circuit 6 for receiving the received RF signal and generating a squared version of the received RF signal, a gain stage 7 for receiving the squared version of the received RF signal and reproducing the second order nonlinear distortion (see col. 3, lines 43-52), and an

output coupling circuit 10 or S for coupling the reproduced second order nonlinear distortion to an output of the receiver to generate a down-converted baseband signal characterized with reduced second order nonlinear distortion (see col. 4, lines 1-19).

Faulkner fails to disclose a squaring circuit for receiving a received RF signal provided to an input of a mixer in the receiver. However, in an analogous art, Kenington discloses a predistorter including a squaring circuit 410 for receiving a received RF signal provided to an input of a mixer 425 in a receiver. See FIG. 11 and col. 7, lines 35-60. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the apparatus of Faulkner by incorporating these features taught Kenington for the purpose of compensating for intermodulation distortion in an amplifier using multiple order polynomial approximation techniques.

The combination of Faulkner, Kenington and Chapman fails to disclose the use of a feedforward technique in the non-linear distortion circuit. However, in an analogous art, Chapman discloses this feature in FIG. 5 and col. 2, lines 18-47. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the apparatus of Faulkner, Kenington and Chapman by incorporating these features taught by Chapman for the purpose of allowing further necessary processing the signal in the feedforward branch to the output.

Regarding claim 48, Faulkner discloses that the receiver includes a mixer 3, and the output coupling circuit couples the reproduced second order nonlinear distortion to an output of the mixer. See FIG. 1.

Regarding claims 49 and 50, Faulkner discloses that the receiver is a zero-IF or a low-IF direct down conversion receiver. See col. 1, lines 42-47.

Regarding claim 51, Faulkner discloses that the output coupling circuit is an adder. See col. 4, lines 1-19 and col. 5, lines 22-36.

Regarding claims 52-56, Faulkner discloses that the receiver includes a mixer, the squaring circuit is part of the mixer and the stage receives the squared version of the received RF signal from the mixer. See col. 3, lines 43-62.

Regarding claims 57-59 and 61, Faulkner discloses that the receiver defines a receiver path and the compensation path operates to provide feed forward second order nonlinear distortion reduction to the receiver path.

Regarding claims 60 and 62, Faulkner discloses that the nonlinear distortion elimination does not introduce other nonlinear distortion in the receiver path.

Regarding claims 63-71, Faulkner discloses calibration of the gain stage, including factory calibration and auto-calibration. See col. 1, lines 28-42, col. 4, lines 20-32, col. 5, lines 49-62, and col. 6, lines 10-34.

Regarding claims 72, 75 and 78, Faulkner discloses that the circuit and receiver are on a single integrated circuit. See col. 3, lines 52-67.

Regarding claim 81, Faulkner discloses an integrated circuit having a receiver 3, 8 and a distortion reduction circuit 5 for reducing second order non-linear distortion in a receiver 3, 8 caused by jammers during direct down conversion of a received RF signal by the receiver, the distortion reduction circuit being adapted to be coupled to the receiver to reproduce the second order nonlinear distortion (intermodulation interference) in the receiver (see col. 3, lines 52-67

and col. 5, lines 5-10) and including a squaring circuit 6 for receiving the received RF signal and generating a squared version of the received RF signal, a gain stage 7 for receiving the squared version of the received RF signal and generating the reproduced second order nonlinear distortion (see col. 3, lines 43-52), and an output coupling circuit 10 or S for coupling the reproduced second order nonlinear distortion to an output of the receiver to generate a down-converted baseband signal characterized with reduced second order nonlinear distortion (see col. 4, lines 1-19).

Faulkner fails to disclose a squaring circuit for receiving a received RF signal provided to an input of a mixer in the receiver. However, in an analogous art, Kenington discloses a predistorter including a squaring circuit 410 for receiving a received RF signal provided to an input of a mixer 425 in a receiver. See FIG. 11 and col. 7, lines 35-60. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the apparatus of Faulkner by incorporating these features taught Kenington for the purpose of compensating for intermodulation distortion in an amplifier using multiple order polynomial approximation techniques.

Claim 82 incorporates the limitations of claims 49, 50 and 81, and is therefore rejected for the same reasons as claims 49, 50 and 81.

Regarding claims 83-85, Faulkner discloses calibration of the gain stage, including factory calibration and auto-calibration. See col. 1, lines 28-42, col. 4, lines 20-32, col. 5, lines 49-62, and col. 6, lines 10-34.

Regarding claim 86, Faulkner discloses an output coupling circuit 10 for subtracting the unwanted second order nonlinear distortion from an output of the receiver to generate a down-

converted baseband signal characterized with reduced second order nonlinear distortion. See col. 3, lines 59-62.

Faulkner fails to disclose a squaring circuit for receiving a received RF signal provided to an input of a mixer in the receiver. However, in an analogous art, Kenington discloses a predistorter including a squaring circuit 410 for receiving a received RF signal provided to an input of a mixer 425 in a receiver. See FIG. 11 and col. 7, lines 35-60. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the apparatus of Faulkner by incorporating these features taught Kenington for the purpose of compensating for intermodulation distortion in an amplifier using multiple order polynomial approximation techniques.

Claim 87 incorporates the limitations of claims 49, 50 and 86, and is therefore rejected for the same reasons as claims 49, 50 and 86.

Regarding claims 88-90, Faulkner discloses calibration of the gain stage, including factory calibration and auto-calibration. See col. 1, lines 28-42, col. 4, lines 20-32, col. 5, lines 49-62, and col. 6, lines 10-34.

Regarding claim 91, Faulkner discloses subtracting, using a feed forward technique, the unwanted second order nonlinear distortion from an output of the receiver to generate a down-converted baseband signal characterized with reduced second order nonlinear distortion. See FIG. 1 and col. 4, lines 1-10.

Faulkner fails to disclose a squaring circuit for receiving a received RF signal provided to an input of a mixer in the receiver. However, in an analogous art, Kenington discloses a predistorter including a squaring circuit 410 for receiving a received RF signal provided to an

input of a mixer 425 in a receiver. See FIG. 11 and col. 7, lines 35-60. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the apparatus of Faulkner by incorporating these features taught Kenington for the purpose of compensating for intermodulation distortion in an amplifier using multiple order polynomial approximation techniques.

Regarding claim 92, Faulkner discloses calibration of the gain stage. See col. 1, lines 28-42, col. 4, lines 20-32, col. 5, lines 49-62, and col. 6, lines 10-34.

Regarding claim 93, Faulkner discloses that the squared version of the received RF signal is internally generated by the mixer. See col. 3, lines 42-67.

Regarding claims 95 and 96, Faulkner discloses that the gain stage generates the second order nonlinear distortion with a variable gain that is temperature dependent. See col. 4, lines 20-37.

4. Claims 73, 74, 76, 77, 79 and 80 are rejected under 35 U.S.C. 103(a) as being unpatentable over Faulkner in view of Kenington and Chapman, and further in view of Rahamim (US 5,541,990).

Regarding claims 73, 74, 76, 77, 79 and 80, the combination of Faulkner, Kenington and Chapman fails to specifically disclose that the circuit and receiver are coupled to a modem for signal processing of the down-converted signal and being responsive to a test signal generated under control of the modem to provide the calibration.

In an analogous art, Rahamim discloses a modem coupled to a receiver Rxin and which includes an integrated circuit in which distortion is reduced. See FIG. 3 and col. 3, lines 37-45.

The integrated circuit is responsive to a test signal generated under control of the modem. See col. 4, lines 17-32. It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the apparatus of the combination of Faulkner, Kenington and Chapman by including a modem and receiver coupling configuration taught by Rahamim so that the number of components in the circuit and receiver are reduced due to a signal processing and testing being controlled from outside the apparatus.

5. Claim 94 is rejected under 35 U.S.C. 103(a) as being unpatentable over Faulkner in view of Kenington and Chapman, and further in view of Kimura (US 5,552,734).

Regarding claim 94, the combination of Faulkner, Kenington and Chapman fails to disclose that the mixer includes cross-coupled transistors, where the squared version of the received RF signal is internally generated at emitters of the transistors, and the reproduced second order nonlinear distortion is coupled to collectors of the transmitters.

However, in an analogous art, Kimura discloses a mixer 42 and squaring circuit 41 where the mixer includes cross-coupled transistors Q5 to Q8, where the squared version of the received RF signal is internally generated at emitters of the transistors, and the reproduced second order nonlinear distortion is coupled to collectors of the transmitters. See FIGS. 6 and 7, and col. 7, line 53 – col. 8, line 30. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the apparatus of the combination of Faulkner, Kenington and Chapman by incorporating the above-noted features in Kimura for the purpose of combining the operations of squaring and mixing in a single unit, thereby saving space in the apparatus.

6. Claim 97 is rejected under 35 U.S.C. 103(a) as being unpatentable over Faulkner in view of Kenington and Chapman, and further in view of Marchesani et al. (US 5,883,551).

Regarding claim 97, the combination of Faulkner, Kenington and Chapman fails to disclose that the gain stage includes a DAC converter providing programmable gain for the reproduced second order nonlinear distortion.

However, in an analogous art, Marchesani discloses a system in which DAC converters 10 and 11 are part of a gain stage that includes variable gain amplifiers 12 and 13. See FIG. 1 and col. 1, lines 45-60. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the apparatus of the combination of Faulkner, Kenington and Chapman by incorporating the above-noted features in Marchesani for the purpose of performing analog calibration functions in the variable gain amplifier.

Response to Arguments

7. Applicant's arguments with respect to the claims have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sam Bhattacharya whose telephone number is (571) 272-7917. The examiner can normally be reached on Weekdays, 9-6, with first Fridays off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, George Eng can be reached on (571) 272-7495. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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